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# GCSE ENGINEERING 8852/W

Unit 1 Written Paper

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Mark scheme

June 2021

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Version: 0.1 Pre-Standardisation

**Note that this mark scheme has not been subject to the standardisation process as no candidates sat the exam.**

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from [aqa.org.uk](http://aqa.org.uk)

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## Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

### Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

### Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

**Glossary for maths**

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

<b>[a, b]</b>	Accept values between a and b inclusive.
<b>For <math>\pi</math></b>	Accept values in the range [3.14, 3.142]
<b>Their</b>	Accept an answer from the candidate if it has been inaccurately calculated but is subsequently used in a further stage of the question.

**Questions which do not ask students to show working**

As a general principle, a correct response is awarded full marks.

Qu	Part	Marking Guidance	Total marks	AO
01	1	<b>C</b> Cast iron	2 marks	AO1 1a
		<b>F</b> Low carbon steel		

Qu	Part	Marking Guidance	Total marks	AO
01	2	<b>D</b> Toughness	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	3	Award <b>one</b> mark for each correct response as shown in bold.	3 marks	AO1 1b
		<p>Ceramic materials have many engineering applications.</p> <p>They are very good <b>insulators</b> for both electricity and heat.</p> <p>However, a disadvantage is <b>brittleness</b>.</p> <p>Ceramic products are usually made by <b>moulding</b> processes.</p>		

Qu	Part	Marking Guidance	Total marks	AO
01	4	<b>A</b> Destructive	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	5	<b>C</b> Lift	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	6	<b>C</b> Normalising	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	7	<b>C</b> Resistor	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO												
02	1	<p><b>Indicative content</b></p> <table border="1"> <thead> <tr> <th>Composite</th> <th>Property</th> <th>Application</th> </tr> </thead> <tbody> <tr> <td>Glass reinforced polymer</td> <td><b>Good chemical resistance and thermal insulation</b></td> <td>Canoes, boat hulls</td> </tr> <tr> <td>Medium Density Fibreboard</td> <td>Smooth surface, easily machined and painted</td> <td><b>Furniture and Panelling</b></td> </tr> <tr> <td><b>Structural concrete</b></td> <td>Reinforced with steel bars for tensile strength</td> <td>Bridges and buildings</td> </tr> </tbody> </table> <p>Accept all other valid responses for properties and applications, eg</p> <p>GRP properties:</p> <ul style="list-style-type: none"> <li>• smooth surface</li> <li>• high strength</li> <li>• low density.</li> </ul> <p>MDF applications:</p> <ul style="list-style-type: none"> <li>• flooring</li> <li>• speaker boxes</li> <li>• cabinets</li> <li>• shelving</li> <li>• mouldings.</li> </ul>	Composite	Property	Application	Glass reinforced polymer	<b>Good chemical resistance and thermal insulation</b>	Canoes, boat hulls	Medium Density Fibreboard	Smooth surface, easily machined and painted	<b>Furniture and Panelling</b>	<b>Structural concrete</b>	Reinforced with steel bars for tensile strength	Bridges and buildings	3 marks	AO1 1a
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Qu	Part	Marking Guidance	Total marks	AO
02	2	<p>Award <b>one</b> mark for each reason given.</p> <p><b>Indicative content</b></p> <p>Reasons:</p> <ul style="list-style-type: none"> <li>• combination of properties</li> <li>• reinforcement</li> <li>• increase in strength</li> <li>• can be moulded</li> <li>• can be machined.</li> </ul> <p>Accept all other valid responses.</p>	2 marks	AO3 1b

Qu	Part	Marking Guidance	Total marks	AO
03	1	<p>Award <b>one</b> mark for each correct stage.</p> <p><b>Indicative content</b></p> <p>Stage 1 Pattern making Pattern made of the shape to be cast.</p> <p>Stage 2 Preparing the mould Pattern set inside and mould filled with sand. Pattern removed to create void.</p> <p>Stage 3 Casting process Heat the metal until molten and pour into the mould.</p> <p>Stage 4 Fettling Removal of excess metal, improve the surface.</p> <p>Accept all other valid responses.</p>	4 marks	AO1 1b

Qu	Part	Marking Guidance	Total marks	AO
03	2	<p>Award <b>one</b> mark for method – pressure die casting.</p> <p>Award <b>one</b> mark for reasons given up to <b>three</b> marks.</p> <p><b>Indicative content</b></p> <p>Pressure Die Casting:</p> <ul style="list-style-type: none"> <li>• used for mass production</li> <li>• accuracy</li> <li>• can reuse the waste metal</li> <li>• used for 3D shapes that would not be cost effective to machine</li> <li>• initial cost of pressure die casting is high</li> <li>• moulds can be used repeatedly.</li> </ul> <p>Accept all other valid responses.</p>	4 marks	AO3 1a

Qu	Part	Marking Guidance	Total marks	AO										
03	3	<table border="1"> <tr> <td>Volume = <math>L \times W \times H</math> <math>550 \times 320 \times 350 = 61\,600\,000 \text{ (mm}^3\text{)}</math></td> <td>1 mark</td> </tr> <tr> <td>Rearrange the formula to:  Mass = Density <math>\times</math> Volume <math>m = p \times v</math> and substitute with their volume and the given density  = their <math>61\,600\,000 \times 0.0027</math></td> <td>1 mark</td> </tr> <tr> <td>Correct answer only for g  = 166 320 (g)</td> <td>1 mark</td> </tr> <tr> <td>For conversion to kg: 166.32 kg if correct or their value in g converted correctly to kg</td> <td>1 mark</td> </tr> <tr> <td>Notes :  Answer 166.32 kg is <b>four</b> marks.  166 320 seen is at least <b>three</b> marks.</td> <td></td> </tr> </table>	Volume = $L \times W \times H$ $550 \times 320 \times 350 = 61\,600\,000 \text{ (mm}^3\text{)}$	1 mark	Rearrange the formula to:  Mass = Density $\times$ Volume $m = p \times v$ and substitute with their volume and the given density  = their $61\,600\,000 \times 0.0027$	1 mark	Correct answer only for g  = 166 320 (g)	1 mark	For conversion to kg: 166.32 kg if correct or their value in g converted correctly to kg	1 mark	Notes :  Answer 166.32 kg is <b>four</b> marks.  166 320 seen is at least <b>three</b> marks.		4 marks	AO2
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Qu	Part	Marking Guidance	Total marks	AO
04	1	<p>Award <b>one</b> mark for each relevant advantage (maximum two marks) and for each relevant disadvantage (maximum two marks).</p> <p>Only award <b>one</b> mark for any flipped answers.</p> <p><b>Indicative content</b></p> <p><b>Advantages of using a thermosetting polymer:</b></p> <ul style="list-style-type: none"> <li>• insulator, low thermal conductivity</li> <li>• tough</li> <li>• mouldable</li> <li>• hard</li> <li>• smooth surface</li> <li>• rigid</li> <li>• chemical, heat and electrical resistance.</li> </ul> <p><b>Disadvantages of using a thermosetting polymer:</b></p> <ul style="list-style-type: none"> <li>• brittle</li> <li>• cannot be reheated to soften, shape or mould</li> <li>• cannot be recycled</li> <li>• goes to landfill</li> <li>• pollution from manufacturing process and material production</li> <li>• made from fossil fuels.</li> </ul> <p>Accept all other valid responses.</p>	4 marks	AO1 1b

Qu	Part	Marking Guidance	Total marks	AO
04	2	<p><b>One</b> mark for naming <b>one</b> suitable manufacturing process for thermoplastic polymers.</p> <p>Up to <b>two</b> marks for correct description of process.</p> <p><b>Indicative content</b></p> <p>Injection moulding – Polymer is heated and injected into a mould under pressure.</p> <p>Rapid prototyping (accept fused deposition) – Prints a product layer by layer using CAD.</p> <p>Press moulding – Polymer is heated and pressed between a two-part mould.</p> <p>Accept all other valid responses.</p>	1 mark 2 marks	AO1 1a AO2

Qu	Part	Marking Guidance	Total marks	AO																
04	3	<p>Award <b>one</b> mark for each relevant property (maximum two marks) and <b>one</b> mark for each relevant explanation (maximum two marks).</p> <p><b>Indicative content</b></p> <table border="1"> <thead> <tr> <th>Properties</th> <th>Explanation</th> </tr> </thead> <tbody> <tr> <td>High strength</td> <td>Maintains its shape well, will not break if dropped.</td> </tr> <tr> <td>Tough</td> <td>Absorbs impact to protect the wearer from injury.</td> </tr> <tr> <td>Heat resistant</td> <td>To protect the wearer from extreme heat.</td> </tr> <tr> <td>Transparent</td> <td>High visibility for wearer.</td> </tr> <tr> <td>Lightweight</td> <td>Comfortable for the user to wear.</td> </tr> <tr> <td>Low-conductivity</td> <td>Protects the wearer from heat and electricity.</td> </tr> <tr> <td>Chemical resistance</td> <td>Protects the wearer from chemical splashes.</td> </tr> </tbody> </table> <p>Accept all other valid responses.</p>	Properties	Explanation	High strength	Maintains its shape well, will not break if dropped.	Tough	Absorbs impact to protect the wearer from injury.	Heat resistant	To protect the wearer from extreme heat.	Transparent	High visibility for wearer.	Lightweight	Comfortable for the user to wear.	Low-conductivity	Protects the wearer from heat and electricity.	Chemical resistance	Protects the wearer from chemical splashes.	4 marks	AO1 1b
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Qu	Part	Marking Guidance	Total marks	AO
05	1	<p>Correct answers</p> <ul style="list-style-type: none"> <li>• Pneumatic system uses compressed air.</li> <li>• Hydraulic system uses fluid.</li> </ul>	2 marks	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO												
05	2	<table border="1"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>3–4</td> <td>A thorough analysis of the suitability of using either a hydraulic or a pneumatic system. Analysis is valid and covers a range of points.</td> </tr> <tr> <td>1</td> <td>1–2</td> <td>A basic analysis of the suitability of using either a hydraulic or a pneumatic system. Analysis may be limited or contain inaccuracies.</td> </tr> <tr> <td>0</td> <td>0</td> <td>No response or nothing worthy of credit.</td> </tr> </tbody> </table> <p><b>Indicative content if hydraulic system selected</b></p> <p><b>Hydraulic system:</b></p> <ul style="list-style-type: none"> <li>• high force</li> <li>• low energy required</li> <li>• low cost</li> <li>• slow in operation</li> <li>• oil/liquid leakage risk</li> <li>• fluid reservoir required</li> <li>• can cause contamination</li> <li>• high levels of maintenance.</li> </ul> <p><b>Indicative content if pneumatic system selected</b></p> <p><b>Pneumatic system:</b></p> <ul style="list-style-type: none"> <li>• fast operation/speed of production</li> <li>• clean, no contamination</li> <li>• high cost</li> <li>• large amounts of energy required.</li> </ul> <p>Accept all other valid responses.</p>	Level	Marks	Description	2	3–4	A thorough analysis of the suitability of using either a hydraulic or a pneumatic system. Analysis is valid and covers a range of points.	1	1–2	A basic analysis of the suitability of using either a hydraulic or a pneumatic system. Analysis may be limited or contain inaccuracies.	0	0	No response or nothing worthy of credit.	4 marks	AO3 1a
Level	Marks	Description														
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0	0	No response or nothing worthy of credit.														

Qu	Part	Marking Guidance	Total marks	AO	
05	3	Area of triangle = $\frac{1}{2} (B \times H)$	3 marks	AO2	
		Area of one triangle $\frac{1}{2} (19 \times 16.45) = 156.28$			1 mark
		Total area their $156.28 \times 35$			1 mark
		Answer = $5469.8 \text{ mm}^2$			1 mark

Qu	Part	Marking Guidance	Total marks	AO
05	4	Total area of aluminium – area of triangles $100 \times 100$ – their $5469.8$ or $10\,000$ – their $5469.8$	2 marks	AO2
		Aluminium remaining Correct evaluation for their value of $5469.8$ or $4530.2 \text{ mm}^2$ if correct.		

Qu	Part	Marking Guidance	Total marks	AO
05	5	<p><b>Indicative content</b></p> <p>Process must be suitable for aluminium.</p> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• anodising</li> <li>• dip coating</li> <li>• lacquer</li> <li>• painting</li> <li>• polishing</li> <li>• powder coating.</li> </ul> <p>Do not accept any unsuitable finishes such as galvanising, electroplating.</p> <p><b>Reason</b></p> <p>To improve:</p> <ul style="list-style-type: none"> <li>• appearance, change colour</li> <li>• corrosion resistance</li> <li>• durability</li> </ul>	2 marks	AO1 1a AO1 1b

		<ul style="list-style-type: none"> <li>• the surface texture</li> <li>• wear resistance.</li> </ul> <p>Accept all other valid responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO												
05	6	<p style="text-align: center;"><b>Table 2</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Item</th> <th>Cost each</th> </tr> </thead> <tbody> <tr> <td>Sheet material</td> <td>£3.15 per m<sup>2</sup></td> </tr> <tr> <td>Rivets</td> <td>1.5p</td> </tr> <tr> <td>Surround</td> <td>£1.87</td> </tr> </tbody> </table> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;"> <math>£3.15 \times 0.38 = 1.197</math>  <math>1.5p \times 4 = 6p</math>  <math>1 \times £1.87 = £1.87</math>                      Total cost of materials = £3.13                 </td> <td style="width: 30%; text-align: center;">1 mark</td> </tr> <tr> <td>                     Total cost of materials + labour cost =  <math>£3.13 + £2.58 = £5.71</math> total unit cost                 </td> <td style="text-align: center;">1 mark</td> </tr> </table>	Item	Cost each	Sheet material	£3.15 per m <sup>2</sup>	Rivets	1.5p	Surround	£1.87	$£3.15 \times 0.38 = 1.197$ $1.5p \times 4 = 6p$ $1 \times £1.87 = £1.87$ Total cost of materials = £3.13	1 mark	Total cost of materials + labour cost = $£3.13 + £2.58 = £5.71$ total unit cost	1 mark	2 marks	AO2
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Qu	Part	Marking Guidance	Total marks	AO						
05	7	<p><b>One</b> mark for recall of the equation</p> <p>Pressure = Force/Area</p> <p><b>Three</b> marks for calculation</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">                     Rearranging the formula:                      Force = Pressure × Area                 </td> <td style="text-align: center; vertical-align: middle;">1 mark</td> </tr> <tr> <td style="padding: 5px;">                     Area calculation:  <math>\pi \times 30 \times 30</math> or <math>3.142 \times 30 \times 30</math>                      Answer range 2826 to 2827.8mm<sup>2</sup> </td> <td style="text-align: center; vertical-align: middle;">1 mark</td> </tr> <tr> <td style="padding: 5px;">                     Force calculation:                      1.5 × their 2826                      Answer range 4239 to 4241.7 N                 </td> <td style="text-align: center; vertical-align: middle;">1 mark</td> </tr> </table>	Rearranging the formula: Force = Pressure × Area	1 mark	Area calculation: $\pi \times 30 \times 30$ or $3.142 \times 30 \times 30$ Answer range 2826 to 2827.8mm <sup>2</sup>	1 mark	Force calculation: 1.5 × their 2826 Answer range 4239 to 4241.7 N	1 mark	1 mark 3 marks	AO1 1a AO2
Rearranging the formula: Force = Pressure × Area	1 mark									
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Force calculation: 1.5 × their 2826 Answer range 4239 to 4241.7 N	1 mark									

Qu	Part	Marking Guidance	Total marks	AO
06	1	<p><b>One</b> mark for each correct answer.</p> <p>Correct answers</p> <ul style="list-style-type: none"> <li>• Part <b>A</b> Fixed pivot point.</li> <li>• Part <b>B</b> Moving pivot point.</li> </ul>	2 marks	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
06	2	<p>Correct answer</p> <p>Oscillating motion</p>	1 mark	AO1 1b

Qu	Part	Marking Guidance	Total marks	AO
06	3	<p>Identified a suitable mechanism such as rack and pinion, crank and slider (<b>one</b> mark).</p> <p>Shown understanding of conversion of motion from rotary (<b>one</b> mark) to linear (<b>one</b> mark).</p> <p>Notes to indicate how the mechanism works (up to two marks).</p> <p><b>Indicative content</b></p> <ul style="list-style-type: none"> <li>• Sketch of chosen suitable method.</li> <li>• Types of motion identified.</li> <li>• Explanation of mechanism when operating.</li> </ul> <p>(Note: To add exemplar material at Pre Stand)</p> <p>Accept all other valid responses.</p>	<p>1 mark</p> <p>2 marks</p> <p>2 marks</p>	<p>AO1 1a</p> <p>AO1 1b</p> <p>AO2</p>

Qu	Part	Marking Guidance	Total marks	AO				
07	1	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%; padding: 5px;"> <p>Area of the rectangles:</p> <math display="block">52 \times 15 = 780 \text{ mm}^2</math> <math display="block">780 \text{ mm}^2 \times 2 = 1560</math> <p>and</p> <p>Area of the triangle:</p> <math display="block">\frac{52 \times 52}{2} = 1352 \text{ mm}^2</math> </td> <td style="width: 30%; text-align: center; vertical-align: middle; padding: 5px;">1 mark</td> </tr> <tr> <td style="padding: 5px;"> <p>Total area:</p> <math display="block">1560 + 1352 = 2912 \text{ mm}^2</math> </td> <td style="text-align: center; vertical-align: middle; padding: 5px;">1 mark</td> </tr> </table>	<p>Area of the rectangles:</p> $52 \times 15 = 780 \text{ mm}^2$ $780 \text{ mm}^2 \times 2 = 1560$ <p>and</p> <p>Area of the triangle:</p> $\frac{52 \times 52}{2} = 1352 \text{ mm}^2$	1 mark	<p>Total area:</p> $1560 + 1352 = 2912 \text{ mm}^2$	1 mark	2 marks	AO2
<p>Area of the rectangles:</p> $52 \times 15 = 780 \text{ mm}^2$ $780 \text{ mm}^2 \times 2 = 1560$ <p>and</p> <p>Area of the triangle:</p> $\frac{52 \times 52}{2} = 1352 \text{ mm}^2$	1 mark							
<p>Total area:</p> $1560 + 1352 = 2912 \text{ mm}^2$	1 mark							

Qu	Part	Marking Guidance		Total marks	AO
07	2	$A = \sqrt{B^2 + C^2}$		3 marks	AO2
		$52^2 = 2704$	1 Maths mark		
		$2704 + 2704 = 5408$	1 Maths mark		
		$\sqrt{5408} = 73.5 \text{ cm}$	1 Maths mark		
		Accept 73.54 or more decimal places			
Award trigonometric working.					



Qu	Part	Marking Guidance			Total marks	AO												
08		<table border="1"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>3–4</td> <td>A thorough, accurate, and fully justified evaluation of the risks associated with chemical etching.</td> </tr> <tr> <td>1</td> <td>1–2</td> <td>A limited evaluation of the risks associated with chemical etching. Evaluation may contain a number of inaccuracies.</td> </tr> <tr> <td>0</td> <td>0</td> <td>No response or nothing worthy of credit.</td> </tr> </tbody> </table> <p>Possible risks:</p> <ul style="list-style-type: none"> <li>• eye damage</li> <li>• skin burns</li> <li>• environmental pollution</li> <li>• inadequate manufacturing standard.</li> </ul> <p><b>Indicative content</b></p> <p>Could get chemicals on your skin when placing PCB in tank – lack of PPE.</p> <p>Could get chemicals in eye – lack of PPE.</p> <p>Could splash chemicals on someone else – m awareness of work area.</p> <p>Splashed chemical may not have been cleaned up – pollution of work area, could get chemicals on skin.</p> <p>Cleaning tank.</p> <p>Environmental pollution when replacing/disposing of chemicals.</p> <p>Machine not correctly maintained, does not work correctly, resulting in inadequate manufacture.</p> <p>Accept all other valid responses.</p>			Level	Marks	Description	2	3–4	A thorough, accurate, and fully justified evaluation of the risks associated with chemical etching.	1	1–2	A limited evaluation of the risks associated with chemical etching. Evaluation may contain a number of inaccuracies.	0	0	No response or nothing worthy of credit.	4 marks	AO3 1b
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09	1	Correct answer  Output device	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO				
09	2	<p><b>One</b> mark for recall of Ohm’s law</p> $R = \frac{V}{I}$ <p>or <math>V = IR</math></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;"> <p>Correct substitution:</p> <p><math>V = 6,</math> <math>I = 0.02, \frac{6}{0.02}</math></p> </td> <td style="text-align: center; vertical-align: middle; padding: 5px;">1 mark</td> </tr> <tr> <td style="padding: 5px;"> <p>Answer:</p> <p>300R or 300Ω</p> </td> <td style="text-align: center; vertical-align: middle; padding: 5px;">1 mark</td> </tr> </table>	<p>Correct substitution:</p> <p><math>V = 6,</math> <math>I = 0.02, \frac{6}{0.02}</math></p>	1 mark	<p>Answer:</p> <p>300R or 300Ω</p>	1 mark	<p>1 mark 2 marks</p>	<p>AO1 1a AO2</p>
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09	3	<p><b>One</b> mark each for:</p> <ul style="list-style-type: none"> <li>• temperature is <math>\geq 30^\circ</math> (decision box)</li> <li>• buzzer on (task box)</li> <li>• drawing line from the no route to the read sensor</li> <li>• labelling and completing all yes routes</li> <li>• labelling all no routes</li> <li>• loop return.</li> </ul> <div style="text-align: center;"> <pre> graph TD     Start([Start]) --&gt; TurnOff[Turn off fan / turn off buzzer]     TurnOff --&gt; Read[Read sensor]     Read -- No --&gt; Read     Read -- Yes --&gt; Fan[Fan switched on]     Fan --&gt; Temp30{&gt;= 30°}     Temp30 -- Yes --&gt; Buzzer[Buzzer on for 30 seconds]     Buzzer --&gt; Read     Temp30 -- No --&gt; Read     </pre> </div> <p>Please note: Candidates may draw their loops on either side of the central boxes. Please award marks if the no loop and/or return loop are drawn on the other side from the diagram shown.</p>	6 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
09	4	Correct answer  Greater than or equal to (one maths mark)	1 mark	AO2

Qu	Part	Marking Guidance	Total marks	AO
09	5	<b>Indicative content</b> <ul style="list-style-type: none"> <li>• Parameters have changed.</li> <li>• Equipment has changed.</li> <li>• Input/ Output has changed.</li> <li>• Developments in technology.</li> <li>• The program may not operate as intended.</li> </ul> Accept all other valid responses.	2 marks	AO1 1b

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<p><b>Indicative Content</b></p> <p>Engineered lifespans is the amount of time that a product is designed to last.</p> <p>Planned obsolescence is a way of manufacturers limiting the life span of a product.</p> <p>Sealed parts enclose components that cannot be easily opened for repair.</p> <p><b>Advantages:</b></p> <ul style="list-style-type: none"> <li>• when parts fail consumers need to buy a new product meaning more sales for manufacturers</li> <li>• manufacturers may not need to provide replacement parts</li> <li>• products will not need to be serviced as frequently</li> <li>• products with sealed parts may be cheaper for the consumer at initial purchase.</li> </ul> <p><b>Disadvantages:</b></p> <ul style="list-style-type: none"> <li>• consumers may not trust the manufacturer for future purchases</li> <li>• additional materials will be used for replacement appliances effecting the environment</li> <li>• broken products could end up in landfill</li> <li>• maybe difficult for consumers to dispose of.</li> </ul> <p>Accept all other valid responses.</p>				

Qu	Part	Marking Guidance	Total marks	AO
10	2	<p>Award <b>one</b> mark for <b>each</b> correct point made (maximum <b>two</b> marks).</p> <p>Accept:</p> <ul style="list-style-type: none"> <li>• regular cleaning (to remove materials that can cause abrasion)</li> <li>• replacing parts (before they fail)</li> <li>• adjust position of part if worn</li> <li>• lubricating regularly.</li> </ul> <p>Accept all other valid responses.</p>	2 marks	AO1 1b

Qu	Part	Marking Guidance	Total marks	AO
10	3	<p>Award <b>one</b> mark for each correct point made (maximum <b>two</b> marks).</p> <p>Accept:</p> <ul style="list-style-type: none"> <li>• for safety – replacing parts before it fails</li> <li>• for efficiency</li> <li>• to prevent additional damage to other parts</li> <li>• to save money by preventing additional damage.</li> </ul> <p>Accept all other valid responses.</p>	2 marks	AO1 1b

Qu	Part	Marking Guidance	Total marks	AO				
10	4	<table border="1" style="width: 100%;"> <tr> <td style="width: 60%;"> <p>Adding the 8 distances together and dividing the total by 8:</p> <math display="block">\frac{25\,200}{8} = 3150</math> </td> <td style="width: 40%; text-align: center;">1 mark</td> </tr> <tr> <td> <p>One mark for correct answer</p> <p>3150</p> </td> <td style="text-align: center;">1 mark</td> </tr> </table>	<p>Adding the 8 distances together and dividing the total by 8:</p> $\frac{25\,200}{8} = 3150$	1 mark	<p>One mark for correct answer</p> <p>3150</p>	1 mark	2 marks	AO2
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10	5	<p><b>Indicative content</b></p> <p>Any <b>two</b> of the following:</p> <ul style="list-style-type: none"> <li>• exceeding the manufacturers recommended mileage</li> <li>• wear and tear on the links/pins</li> <li>• signs of the chain stretching</li> <li>• chain does not operate smoothly</li> <li>• gear change does not operate smoothly</li> <li>• slippage</li> <li>• breakage.</li> </ul> <p>Accept all other valid responses.</p>	2 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
11	1	<p><b>Indicative content</b></p> <p>Any <b>one</b> of the following:</p> <ul style="list-style-type: none"> <li>• visual check</li> <li>• measurements of length/width/height</li> <li>• weight</li> <li>• fitting/assembly of part</li> <li>• application of tolerance</li> <li>• material quality/defects</li> <li>• safety</li> <li>• comparative check.</li> </ul> <p>Accept all other valid responses.</p>	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
11	2	<p>Award <b>one</b> mark for a simple, unjustified and relevant statement.</p> <p>Award <b>two</b> marks for a correct and justified or explained statement.</p> <p>For example Parts may not fit together (one mark) meaning they may need to be remade. (one mark)</p> <p><b>Indicative content</b></p> <ul style="list-style-type: none"> <li>• Failure to use could lead to parts not fitting together.</li> <li>• Parts may need to be remade, wasting time and money.</li> <li>• Product must meet standards, fit within set limits.</li> <li>• Parts must work/function.</li> </ul> <p>Accept all other valid responses.</p>	2 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
11	3	<p>Award <b>one</b> mark for each correct tool name.</p> <p>Award up to <b>two</b> marks for a correct description of use.</p> <p><b>Note:</b> Marks may be awarded for use without the tool name.</p> <p>Correct answers</p> <p>Tool 1 Micrometer                      Tool 2 (Digital) Vernier</p> <p><b>Indicative content</b></p> <p>Micrometer:</p> <ul style="list-style-type: none"> <li>• used to check small distances</li> <li>• object is placed in the gap in the frame</li> <li>• turn the spindle so it is up against the object</li> <li>• read the measurement.</li> </ul> <p>(Digital) Vernier calipers:</p> <ul style="list-style-type: none"> <li>• can be used for internal and external measurements</li> <li>• direct reading</li> <li>• turn the calipers on and set to zero</li> <li>• object is placed in the gap between the jaws</li> <li>• turn the screw to close the jaws</li> <li>• read the measurement on the display.</li> </ul> <p>Accept all other valid responses.</p>	2 marks 2 marks	AO1 1a AO2

Qu	Part	Marking Guidance	Total marks	AO
12	1	<p><b>Indicative content</b></p> <p>Renewable source:</p> <ul style="list-style-type: none"> <li>• solar power</li> <li>• wind power</li> <li>• tidal power.</li> </ul> <p>Non-renewable:</p> <ul style="list-style-type: none"> <li>• nuclear energy</li> <li>• fossil fuels (gas, coal, petrol, diesel).</li> </ul> <p>Accept all other valid responses.</p>	2 marks	AO1 1a



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